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METHOD FOR THE MANUFACTURE OF A RIGID STRUCTURAL ELEMENT OF A SPORTS ARTICLE

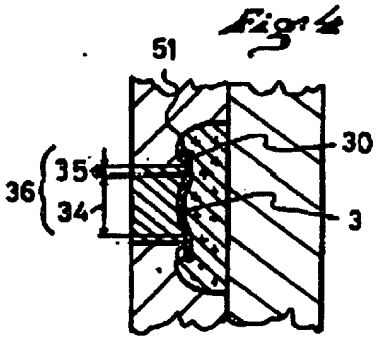
The invention concerns a method for the manufacture of a rigid construction element of a sports article comprising a body (2) made of plastic and at least one insert (3) which is connected to the plastic body and has a part (36) which is visible from the exterior and a connection part (30) for connection with said body, characterized in that it comprises the following steps:

positioning the insert (3) in a mold (4),

deformation of at least a portion (34) of the visible part (36) of the insert by injection under pressure of a plastic material into the mold, and at the same time, establishing the connection of the insert (3) with the body (2) by duplicate molding of the connection part (30) of the insert.

By such a method, one can prepare structural elements which present improved mechanical and/or aesthetic characteristics while reducing the number of manufacturing steps required in comparison to the traditional known methods.

Fig 4



Description

[0001]

The invention relates to a method for the manufacture of a rigid structural element of a sports article, such as ice skates or roller skates, a connection for ski or snowboard, or other sports articles comprising rigid parts.

[0002]

The expression structural element denotes any part which receives and transmits large mechanical stresses, such as twisting or bending stresses.

[0003]

The invention is advantageously applied in the construction of a frame for the skates, notably in-line roller skates or ice skates.

[0004]

The frame is intended to ensure the connection between the foot of the skater and the sliding device(s) proper; namely wheels or rollers or an ice skating blade.

[0005]

The frame generally comprises bearing surfaces which are capable of receiving a shoe and two substantially parallel lateral flanges which are oriented longitudinally, where the bearing surface form transverse bridges connecting the two lateral flanges.

[0006]

Moreover, the frame must present sufficient mechanical properties to resist the bending and twisting forces which are applied by the skater. A good rigidity/flexibility compromise is sought to simultaneously ensure a good transmission of the forces and also a certain damping of shocks and vibrations. Finally, the frame must remain sufficiently light to reduce skater fatigue.

[0007]

The currently known techniques for the manufacture of frames do not satisfy all these requirements while maintaining a reasonable manufacturing cost.

[0008]

It is known to manufacture a frame from a metal sheet by folding the latter as described in the Patent DE 1 033 569. Such a manufacturing principle, while being inexpensive, does not allow the manufacture of frames with high mechanical resistance, except if one considerably increases the thickness of the metal sheet and thus its weight, and, to an even lesser extent, it allows the obtention of certain degrees of flexibility at chosen places. This technique also limits the choices of aesthetic differentiation and the design effects.

[0009]

Another technique, which is routinely used, consists in making the frames entirely by molding from synthetic or metal materials. The integral molding has the advantage of offering a fairly broad range of shapes, but, otherwise, it presents certain drawbacks, the principal one

being connected with the difficulty of achieving a satisfactory rigidity/flexibility compromise, unless one provides local variations in thickness, which leads to the design and manufacture of complicated and expensive molds.

[0010]

In this field, frames made of composite fibers are also used. Such frames can be effectively made in practically all possible shapes, but they are expensive to make because it is difficult to manufacture on them an industrial scale. These frames also suffer from a lack of flexibility, and hence a lack of comfort, and they are also fairly fragile.

[0011]

It is known to manufacture a frame from an extruded metal profiled bar and to machine this bar to obtain the desired final shape. Such a method, as described in US Patent 5 388 846 is also very expensive to manufacture because of the required machining time and the large quantity of material used to make a single piece.

[0012]

The Patent Application WO 97/33665 proposes a solution which consists in manufacturing a frame consisting of two materials having different mechanical properties, which are connected to each other.

[0013]

The Patent Application WO 97/33665 proposes to include a duplicate molded reinforcement element in a plastic frame flange; the reinforcement element can be made of metal and produced by cutting followed by cold working to confer to it the shape of a rib having a generally curved shape. Such an invention makes it possible to manufacture frames which ingeniously combine the materials and their position in the frame to obtain a better flexibility/rigidity compromise. The plastic material which constitutes the major part of the frame, in this case, is responsible for the flexibility, the damping and the lightness, while the metal which is used locally provides the additional properties of stiffness and resistance to the assembly. It also participates in the aesthetic enrichment and the general attractive appearance of the product.

[0014]

However, the method for the obtention of a product comprises a large number of manufacturing steps and thus it still remains fairly expensive. In particular, one must provide prior steps of cutting and then cold working of the insert, which require adapted means to be carried out, notably the production of impressions in the molds. In addition, for a construction which comprises an insert on each side of the frame, where the insert has an asymmetrical longitudinal profile, as is often the case for technical or aesthetic reasons, one must provide different right and left inserts. Naturally, this increases the management constraints and the manufacturing costs.

[0015]

The purpose of the present invention is to overcome these drawbacks by proposing a method for the manufacture of a structural element of a gliding sports article, notably a part of a

skate frame, which method preserves the advantages of the prior art of the document WO 97/33666, and, simultaneously, the reduction of the number of manufacturing steps and the limitation of the number of different pieces to be managed, thus reducing the production costs and the costs of management connected with the manufacturing.

[0016]

For this purpose, the method comprises the following steps:

positioning of an insert in a mold,

injection of a plastic material in the mold at high pressure to obtain the "in situ" deformation of the insert according to a desired profile.

[0017]

It was surprisingly discovered that it was possible to omit a prior step of shaping of the insert by carrying out the shaping directly in the mold due to the pressure exerted by the plastic during the injection.

[0018]

According to an advantageous characteristic of the invention, one uses an insert which has a planar starting configuration. Thus, it is possible to reduce the number of pieces used, for example, for the right and left pieces.

[0019]

The invention can also be defined a method for the manufacture of a rigid construction element of a sliding sports article, which comprises a plastic body and at least an insert connected to the plastic body, which insert has a part which is visible from the exterior, and a connection part for connection with said body, characterized in that it comprises the following steps:

positioning the insert in a mold,

deforming at least a portion of the visible part of the insert by injection under pressure of a plastic into the mold and, at the same time, establishment of the connection between the insert and the body by duplicate molding of the connection part of the insert.

[0020]

The invention which has been defined in this manner presents numerous advantages compared to the state of the art. The invention makes it possible to manufacture an element comprising multiple pieces during the course of a single operation in which the shaping and the connection of the pieces to each other are achieved during the course of a single operation leading to the creation of an assembly procedure which is simultaneously simple and economic, while presenting desired the mechanical and aesthetic properties.

[0021]

Other properties and advantages of the invention will become apparent from the detailed description of the figures, in which:

Figure 1 illustrates a front view of a frame element for a skate, which was obtained according to the method of the invention;

Figure 2 is a cross section of the element of Figure 1 along the section 2-2;

Figure 3 illustrates a partial view in cross section of a mold arrangement before the operation of injection;

Figure 4 illustrates a partial view in cross section of a mold arrangement after the operation of injection;

Figure 5 shows the interior of a mold made of two parts in the open position; and

Figure 6 is a front view of the insert before deformation.

[0022]

Figure 1 shows an element 1 of a frame, in particular for an in-line skate. Such an element is usually called "flange." The flange is the lateral part of the frame which generally comprises two such flanges, separated transversely and arranged substantially in parallel. The flanges are interconnected transversely by platforms, in general one in the front and one in the back, which are intended to support the shoe of the skater. The general cross section of the frame is thus in the shape of an upside down U at the level of the platforms. The flanges can be formed separately, as in the present example, and then assembled to the platforms. In an alternative, the frame can be formed from a single part which comprises the flanges and the platforms. The method of the invention is not limited to any one of these shapes.

[0023]

The represented flange 1 is formed from an elongated body 2 which presents a front region (AV) and a back region (AR). Each region comprises a top zone 10, 11 which is fitted with a substantially planar edge 12, 13, intended for the transverse alignment of a platform (not shown). The zones 10, 11 comprise perforation holes 14, 15 which are intended for the passage of a plurality of fixation means (screws, rivets, ...) and guide means for the platforms.

[0024]

The flange also comprises a lower region 16, which is equipped with aligned holes 17, 18, 19, 20 for the passage of a device for a wheel assembly device. Each hole represents the centering region of a wheel (not shown). By means of some adjustments, such a flange could also be used for mounting a blade intended for ice skating.

[0025]

The flange comprises a central recess 21 which contributes to making the structure light.

[0026]

The flange comprises a reinforcement rib 22 which extends longitudinally over a part of its length and whose profile is slightly curved; overall, this arrangement confers a certain stiffness, such as a reinforcement bridge connecting the two top zones 10, 11. In the rib 22, a rigid insert 3, having an elongated and curved shape, is housed. The insert presents a cross section having a bulging or convex shape, which confers relief to the rib, whose functions can be mechanical and/or aesthetic.

[0027]

The body 2 of the flange is advantageously made of a plastic material for reasons of flexibility, lightness and cost. With regard to the insert, it is advantageously made of a rigid metal or plastic material, which may or may not be reinforced.

[0028]

The method according to the invention is illustrated in detail in Figures 3 and 4. The mold itself comprises two principal parts 40, 41, which are assembled along a connection plane 45. The assembly of the two parts 40, 41 delimits a principal cavity 5 having the shape of the body of the flange. Thus, an insert 3 is maintained in position in the mold 4 and supported in contact with a mold part 43 presenting a counter shape 44. The mold part 4 can be formed from a mold piece which can be separated, as shown in the figures, or it can constitute an integral part of the mold part 41. The advantage of the separable part is that it allows the replacement at low cost of the counter shape.

[0029]

According to the invention, a portion of the surface of the insert rests on the mold part 41 along a closed contour 46 which delimits, between the insert and said mold part, a secondary cavity 50 which is sealed against the passage of the plastic. The surface portion of the insert which rests on the mold can constitute a surface portion 35 of varying size for the separation between the secondary cavity 50 and the rest of the cavity 5. Indeed, one of the difficulties of the method is to prevent the passage of the plastic which is injected into the part reserved for the deformation of the insert by an appropriate positioning of the insert which functions as a barrier against the introduction of the plastic. Once the element is finished, it is distinguished by a visible part 36 of insert whose surface will be represented by the internal surface 34 of the insert, which is in contact with the counter shape 44 after the deformation of the insert, and of the surface portion 35 corresponding to the contour 46.

[0030]

Figure 4 shows the operation of injection of the plastic at high pressure. The injection takes place during a cycle of approximately 40 sec to 1 1/2 min, where the plastic is heated at the inlet of the injection point to a temperature on the order of 250-260°C at a pressure of approximately 500-700 bar, preferably 600 bar. Then, the pressure is still maintained for 40-50 sec at approximately 500 bar without heating until the material hardens sufficiently for the piece to be withdrawn from the mold at approximately 70-90°C, more specifically 85°C. Because of the high exerted pressure, one notes that the plastic imparts a deformation to the insert until it matches the counter shape 44. Naturally, the capacity to deform the insert depends on numerous factors, the principal one being the internal pressure exerted by the plastic. Other factors are more connected with the characteristics of the insert; namely, the thickness of the insert as well as its mechanical characteristics. Good results have been obtained with aluminum alloys having the following mechanical properties:

Young's modulus:
72 Gpa;
Cold worked hardness:
H18;
Maximum resistance:
140-170 N/mm^2;
Resistance at 0.2% deformation (Rp 0.2):
135-155 N/mm^2;
Maximum elongation at rupture (A):

3%.

[0031]

Among the numerous plastics which can be used in the context of the invention, one can cite as nonlimiting example, charged or uncharged polyamides. Conclusive tests have been obtained with PA6 consisting of 30% glass fibers, with or without filler.

[0032]

It is preferred for the insert to comprise edges 30 which extend in the principal cavity beyond the closed contour 46 which forms, with the wall of the mold 47, zones 51 which are reserved for the introduction of the plastic to obtain the immobilization of the insert by duplicate molding of these edges 30, which then constitute the connection part of the insert for connecting with the body of the flange. Thus, by a single operation of injection, one simultaneously obtains the shaping of the insert to the desired shape and its fixation to the rest of the flange

[0033]

Figure 5 illustrates the preparation of the mold 4 before the closing. The insert 3 is positioned in the part 41 of the mold with the aid of positioning and support means. These means can be retractable engagement elements 60, 61, which are preferably localized at each end of the insert. The engagement elements work in cooperation with holes 32, 33, made in the ends of the insert to maintain the insert at a distance from the bottom of the mold part 41. The injection pressure is sufficient to cause the retraction of the engagement means toward the interior of the mold before the solidification of the plastic.

[0034]

Other positioning and support means can be bracing elements 63, 64, which are provided over the length of the insert. These means can be simple retractable broaches which are mounted on a spring and rest on the surface of the insert in the deformable part of the insert. Another important role of these positioning and support means 60, 61, 62, 63 is to maintain a support which is substantially distributed over the entire surface of the insert along the contour 46 against the counter shape to ensure the seal in the cavity 50. Naturally, other positioning means can be considered, such as, for example, magnetic, adhesive means, means which work by aspiration, low pressure, suction caps and gravity, etc.

[0035]

Figure 6 shows a view of the insert which is in the shape of a rigid insert piece cut according to a desired pattern. The visible part after partial duplicate molding represents the part 36 which is delimited by the dotted line. The edges or connection part of the insert represent the part 30 located outside the dotted line. The surface portion 34 which is delimited by the continuous line represents the portion which is subjected to the deformation of the insert.

[0036]

The insert is manufactured from a relatively rigid sheet of material, such as a metal sheet or a plastic sheet, which may or may not be reinforced. However, it is preferred to use a sheet made of metal, in particular a sheet made of aluminum or an aluminum alloy. The thickness of such a sheet is preferably between 0.2 and 1.5 mm.

[0037]

Naturally, the invention is not strictly limited to the embodiment which has been described with reference to the figures, rather it includes any type of method within the scope of the following claims.

Claims

1. Method for the manufacture of a rigid structural element of a sports article, notably of at least a part of a skate frame, characterized in that it comprises the following steps:

positioning of an insert (3) in a mold (4),

injection of a plastic material in the mold at high pressure to obtain the "in situ" deformation of the insert (3).

2. Manufacturing method according to Claim 1, characterized in that the insert (3) is maintained in position in the mold (4) in a substantially planar starting configuration.

3. Manufacturing method according to Claim 1, characterized in that the insert (3) is maintained in position in contact with a mold part (43) which presents a counter shape (44), where the insert is then deformed permanently by the injection pressure until it matches the counter shape (44).

4. Manufacturing method according to Claim 3, characterized in that the insert (3) rests on said mold part (43) along a closed contour (46) to delimit between them a sealed cavity (50) which is sealed against the passage of the injected plastic.

5. Manufacturing method according to Claim 4, characterized in that the insert (3) comprises edges (30) which extend beyond the closed contour (46) to form, with the wall (47) of the mold, zones which are reserved for the introduction of the plastic to obtain the immobilization of the insert (3) by duplicate molding of the edges (30).

6. Manufacturing method according to Claim 1, characterized in that the insert (3) comprises a metal or plastic sheet which may or may not be reinforced.

7. Manufacturing method according to Claim 6, characterized in that the insert comprises a sheet made of aluminum or of an aluminum based alloy, having a thickness between 0.2 and 1.5 mm.

8. Manufacturing method according to Claim 3, characterized in that positioning and support means maintain the insert in a position where it rests along the closed contour (46) on the counter shape.

9. Manufacturing method according to Claim 8, characterized in that the positioning and support means comprise retractable engagement elements (60, 61) which work in cooperation with holes (32, 33) made through the insert.

10. Manufacturing method according to Claim 8, characterized in that the means for positioning and support comprise bracing elements (63, 64) which are formed from retractable gauge rods which are mounted on a spring and which are supported on the deformable part of the insert.

11. Manufacturing method according to Claim 8, characterized in that the positioning means comprise means chosen from magnetic means, adhesion means, means which work by aspiration, low pressure, suction caps or gravity.

12. Manufacturing method according to any one of the preceding claims, characterized in that the rigid structural element concerns a flange (1) of a frame of an in-line skate.

13. Method for the manufacture of a rigid construction element of a sports article comprising a plastic body (2) and at least one insert (3) which is connected to the plastic material and has a part (36) which is visible from the exterior, and a connection part (30) for connection with said body, characterized in that it comprises the following steps:

positioning of the insert (3) in a mold (4),

deformation of at least a portion (34) of the visible part (36) of the insert by injection under pressure of a plastic into the mold and, at the same time, establishment of the connection between the insert (3) and the body (2) by duplicate molding of the connection part (30) of the insert.

Fig: 1

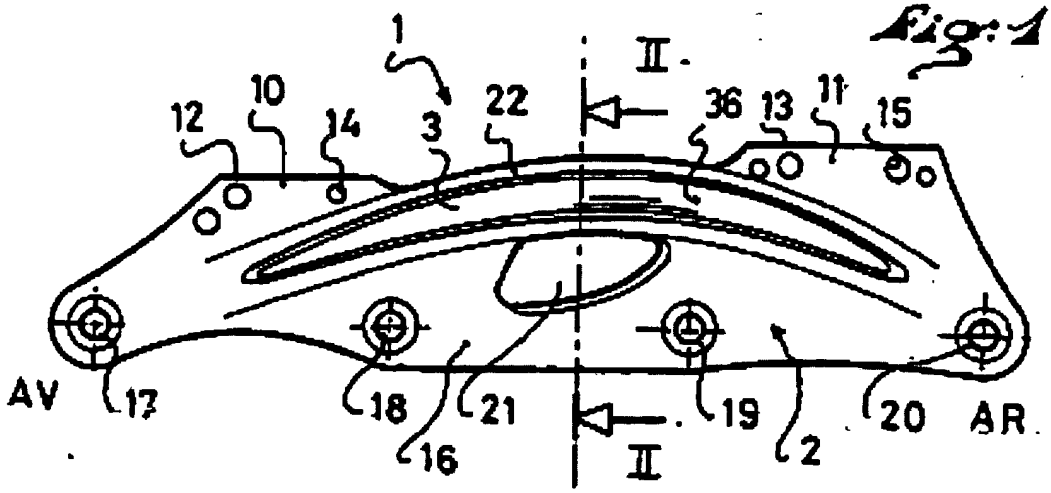


Fig: 2

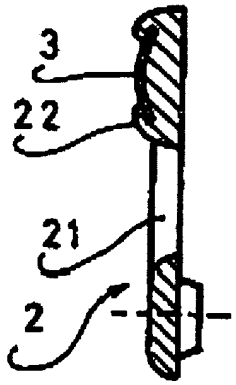


Fig: 3

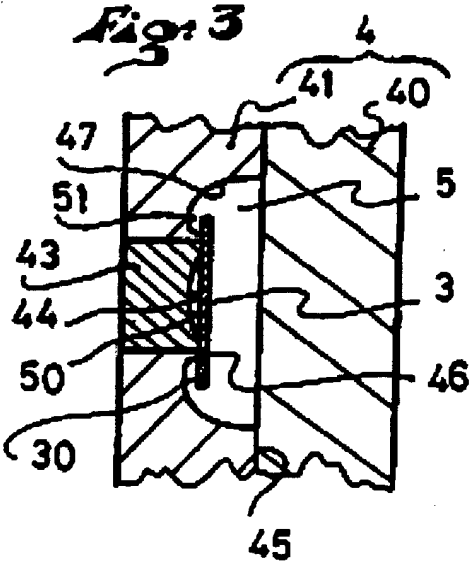


Fig: 4

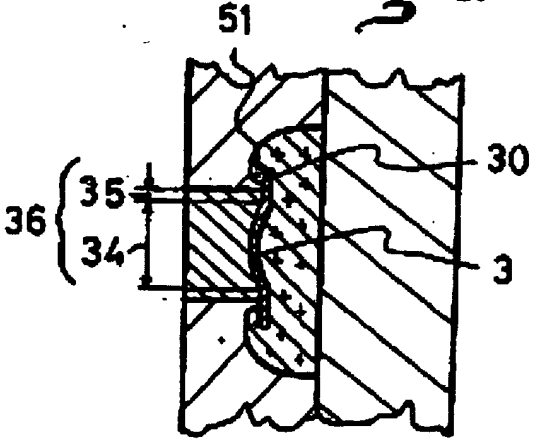


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Fig.5

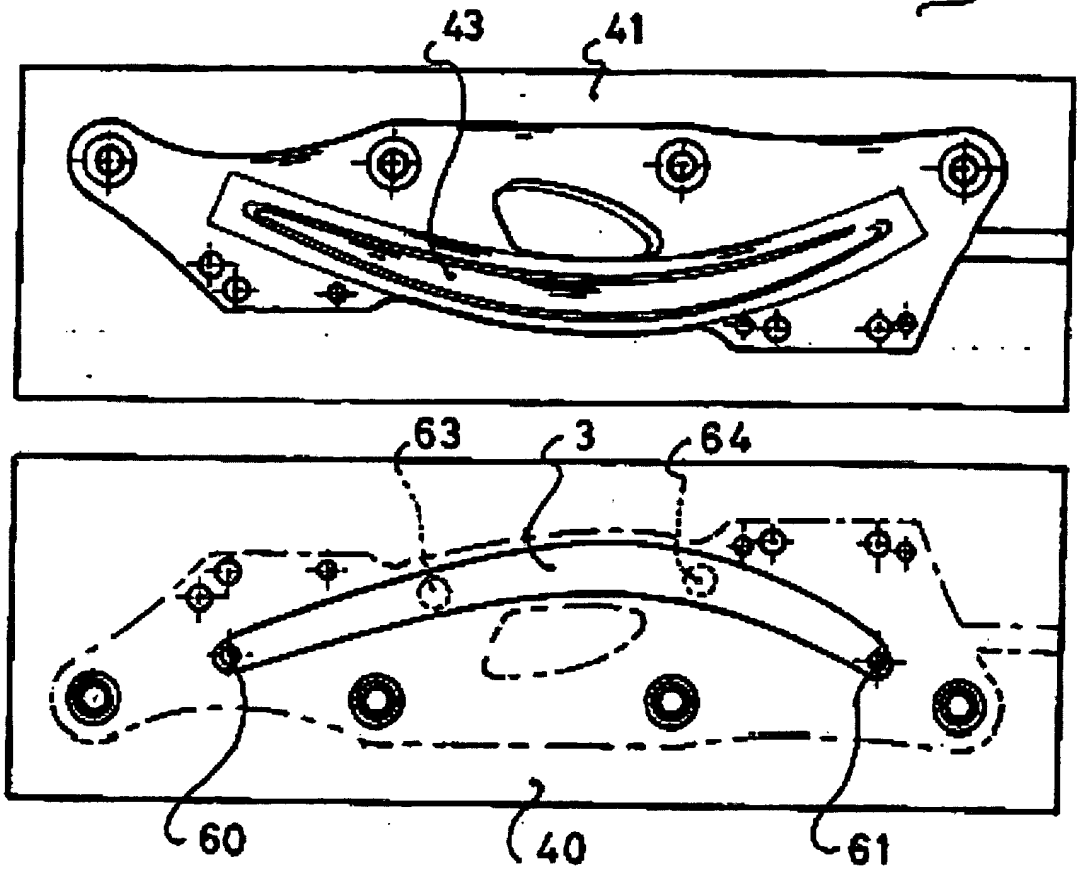
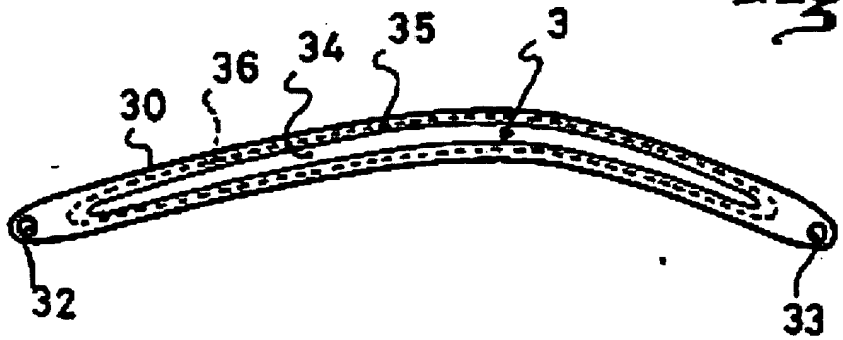


Fig.6



European Patent Office

Application Number EP 99 10 0760

EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl[6])
D,Y	WO 97 33666 A (SALOMON SA) September 18, 1997 * the whole document * ---	1,6,12,13	B29C45/14 A63C17/00
D,Y	WO 97 33665 A (SALOMON SA) September 18, 1997 * the whole document * ---	1,6,12,13	
Y	PATENT ABSTRACTS OF JAPAN Vol. 6, No. 157 (M-150), August 18, 1982 -& JP 57 074137 A (YOSHIDA KOGYO KK), May 10, 1982 * abstract * ---	1-4,8,11, 13	TECHNICAL FIELDS SEARCHED (Int. Cl.[6]) B29C A63C
Y	FR 89 746 E (R. FAILLARD) August 4, 1967 * the whole document * ---	1-4,6,8, 9,13	
Y	AU 428 765 B (A. J. PARKES & CO) December 10, 1972 * the whole document * ---	1-5,8, 11,13	
Y	PATENT ABSTRACTS OF JAPAN Vol. 4, No. 60 (M-010), May 6, 1980 & JP 55 027252 A (MATSUSHITA ELECTRIC WORKS LTD), February 27, 1980 * abstract * ---	1-5,8, 11,13	
Y	PATENT ABSTRACTS OF JAPAN Vol. 11, No. 213 (M-605), July 10, 1987 & JP 62 030012 A (MITSUBISHI ELECTRIC CORP), February 9, 1987 * abstract * -----	9	
The present search report has been drawn up for all claims.			

Place of search	Date of completion of the search	Examiner
THE HAGUE	May 12, 1999	Bollen, J

CATEGORY OF CITED DOCUMENTS

X: Particularly relevant if taken alone.
Y: Particularly relevant if combined with another document of the same category.
A: Technological background.
O: Non-written disclosure.
P: Intermediate document.

T: Theory or principle underlying the invention.
E: Earlier patent document, but published on, or after the filing date.
D: Document cited in the application.
L: Document cited for other reasons.

&: Member of the same patent family, corresponding document.

APPENDIX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 10 0760

In this appendix, the patent family members of patent documents listed in the above-referenced European Search Report are indicated.

The data on the family members correspond to the state of the files of the European Patent Office on May 12, 1999

These data serve only for information and are given without guarantee

Patent document listed in the search report		Date of publication	Member(s) of the patent family			Date of publication
WO 9733666	A	September 18, 1997	FR	2746024	A	September 19, 1997
			EP	0886539	A	December 30, 1998
			EP	0886540	A	December 30, 1998
			WO	9733665	A	September 18, 1997
WO 9733665	A	September 18, 1997	FR	2746024	A	September 19, 1997
			EP	0886539	A	December 30, 1998
			EP	0886540	A	December 30, 1998
			WO	9733666	A	September 18, 1997
FR 89746	E		NONE			
AU 428765	B	September 29, 1972	AU	3894268	A	December 10, 1972

For additional details regarding this Appendix: see Official Journal of the European Patent Office No. 12/82